

Solomon Practice Paper

Core Mathematics 3L

Time allowed: 90 minutes

Centre: www.CasperYC.club

Name:

Teacher:

Question	Points	Score
1	6	
2	7	
3	8	
4	9	
5	9	
6	10	
7	12	
8	14	
Total:	75	

How I can achieve better:

-
-
-



Last updated: May 5, 2023

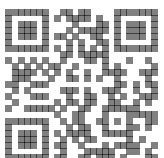


1.

$$f(x) \equiv \frac{2x - 3}{x - 2}, \quad x \in \mathbb{R}, x > 2.$$

- (a) Find the range of f . [2]
- (b) Show that $ff(x) = x$ for all $x > 2$. [3]
- (c) Hence, write down an expression for $f^{-1}(x)$. [1]

Total: 6



2. Solve each equation, giving your answers in exact form.

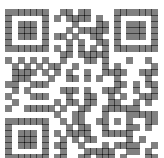
(a) $e^{4x-3} = 2$

[3]

(b) $\ln(2y - 1) = 1 + \ln(3 - y)$

[4]

Total: 7



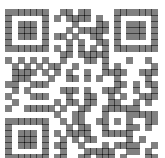
3. The curve C has the equation $y = 2e^x - 6 \ln(x)$ and passes through the point P with x -coordinate 1.

(a) Find an equation for the tangent to C at P . [4]

The tangent to C at P meets the coordinate axes at the points Q and R .

(b) Show that the area of triangle OQR , where O is the origin, is $\frac{9}{3-e}$. [4]

Total: 8



4. (a) Express

$$\frac{x - 10}{(x - 3)(x + 4)} - \frac{x - 8}{(x - 3)(2x - 1)}$$

[5]

as a single fraction in its simplest form.

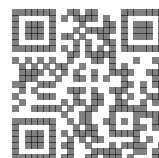
(b) Hence, show that the equation

$$\frac{x - 10}{(x - 3)(x + 4)} - \frac{x - 8}{(x - 3)(2x - 1)} = 1$$

[4]

has no real roots.

Total: 9

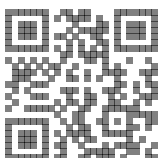


5. Find the values of x in the interval $-180^\circ < x < 180^\circ$ for which

[9]

$$\tan(x + 45)^\circ - \tan(x)^\circ = 4,$$

giving your answers to 1 decimal place.



6. (a) Sketch on the same diagram the graphs of

[6]

$$y = |x| - a \quad \text{and} \quad y = |3x + 5a|,$$

where a is a positive constant.

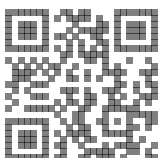
Show on your diagram the coordinates of any points where each graph meets the coordinate axes.

(b) Solve the equation

[4]

$$|x| - a = |3x + 5a|.$$

Total: 10



7. (a) Use the identity [3]

$$\cos(A + B) \equiv \cos(A) \cos(B) - \sin(A) \sin(B)$$

to prove that

$$\cos(x) \equiv 1 - 2 \sin^2\left(\frac{x}{2}\right).$$

- (b) Prove that, for $\sin(x) \neq 0$, [3]

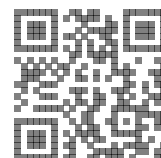
$$\frac{1 - \cos(x)}{\sin(x)} \equiv \tan\left(\frac{x}{2}\right).$$

- (c) Find the values of x in the interval $0 \leq x \leq 360^\circ$ for which [6]

$$\frac{1 - \cos(x)}{\sin(x)} = 2 \sec^2\left(\frac{x}{2}\right) - 5.$$

giving your answers to 1 decimal place where appropriate.

Total: 12



8. A curve has the equation $y = (2x + 3)e^{-x}$.

- (a) Find the exact coordinates of the stationary point of the curve. [4]

The curve crosses the y -axis at the point P .

- (b) Find an equation for the normal to the curve at P . [2]

The normal to the curve at P meets the curve again at Q .

- (c) Show that the x -coordinate of Q lies in the interval $[-2, -1]$. [3]

- (d) Use the iterative formula [3]

$$x_{n+1} = \frac{3 - 3e^{x_n}}{e^{x_n} - 2},$$

with $x_0 = -1$, to find x_1, x_2, x_3 and x_4 . Give the value of x_4 to 2 decimal places.

- (e) Show that your value for x_4 is the x -coordinate of Q correct to 2 decimal places. [2]

Total: 14

